FUTV3501C
DVB-T Modulator

User's Manual

FMUSER 广州汉婷

NMS Version: 1.14.6

SW Version: 9.12

HW Version: 0.4

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Chapter 1 Introduction

1.1 Outline

The FMUSER FUTV3501C DVB-T Modulator is a high performance modulator developed according to the DVB-T (EN300744) standard. It adopts advanced framing structure, channel encoding and modulation technology. It supports both MFN (Multi-frequency network) and SFN (single frequency network). It equipped with four ASI hot backup input, one GPS 10MHz input port and one 1PPS input port. In order to improve the output performance of the transmitter, this DVB-T modulator also simultaneously supports adaptive linear and nonlinear digital pre-distortion. Moreover, this device facilitates the local and remote control with SNMP software.

1.2 Features

- Fully complying with DVB-T standard (EN300744)
- 4 ASI in, 1 RF in, 10MHz reference clock and 1PPS in
- Support both SFN and MFN
- Transmission mode: 2k, 8k
- Hierarchical modulation: Alpha1, 2 and 4
- Transmission bandwidth 6M, 7M and 8M

- Excellent phase noise and MER performance, MER≥42db
- RF output range 30~960MHz, 1hz step
- Supports adaptive linear digital pre-distortion (DPD)
- Supports adaptive non-linear digital pre-distortion (DPD)
- Constant temperature crystal oscillator, frequency stability is high up to 0.1ppm
- Full-size front panel LCD display and keyboard, SNMP software management.

1.3 Specifications

Input	4 channels ASI input, hot backup, BNC port	
	GPS 10Mhz reference clock input, BNC port	
	GPS 1PPS input, BNC port	
	1 RF input for DPD -25dbm~+5dbm	
Modulation	standard	EN300 744
	FFT	2K，8K
	bandwidth	5M, 6M, 7M, 8M
	constellation	QPSK, 16QAM, 64QAM
	Guard interval	1/4, 1/8, 1/16, 1/32
	FEC	1/2, 2/3, 3/4, 5/6, 7/8
	Hierarchical Modulation	Alpha=1, 2, 4
RF output	interface	N type, 50Ω impedance
	RF range	30~960MHz，1hz step
	ATT	-25dbm~+3dbm，0.1db step
	MER	≥ 42db
Non-linear DPD	over 10db ACPR improvement (normally)	
Linear DPD	over 10db non-flatness adjustment(normally)	
System	LCD display & keyboard operation, NMS operation	
	Software upgrading through network	
General	Demission (W*L*H)	440mm×414mm×44.5mm
	Weight	4.9kg
	Temperature	0~45℃(operation)，-20~80℃(storage)
	Power Supply	AC 110V-220V±10%，50/60Hz
	Power Consumption	≈25W

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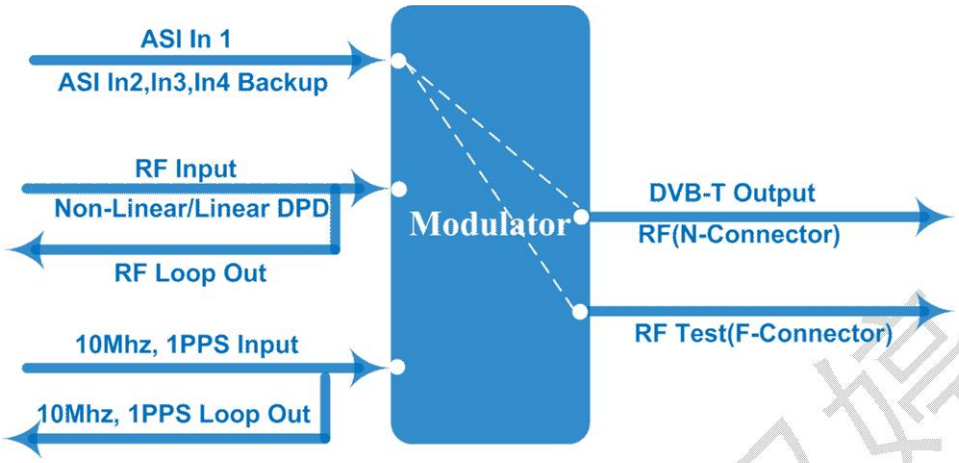
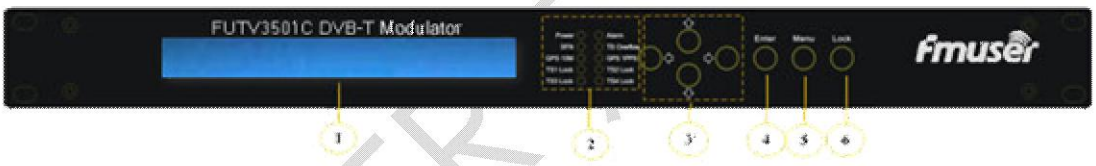
1.4 Principle Chart



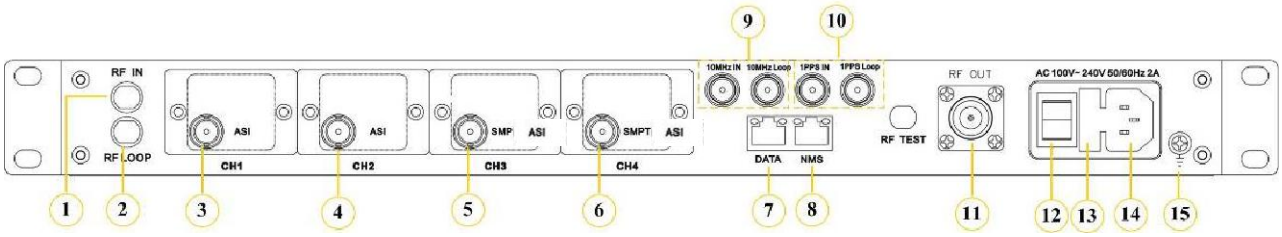
1.5 Appearance and Description

Front Panel Illustration



1		LCD Screen
2	Indicators	Power Indicator
		Alarm Indicator
		SFN Indicator
		TS overflow Indicator
		GPS 10M Reference Clock Indicator
		GPS 1PPS Indicator
		ASI1 input Lock Indicator
		ASI2 input Lock Indicator
		ASI3 input Lock Indicator
		ASI4 input Lock Indicator
3		Left /Right /Up /Down Arrows
4		Enter key
5		Menu Key
6		Lock key

Rear Panel Illustration



1	RF Input Port			
2	RF Loop out Port			
3	Hierarchy Mode: None	ASI Input Port	Hierarchy Mode: Alpha 1/2/4	HP Input Port
4		ASI Input Port		HP Input Port
5		ASI Input Port		LP Input Port
6		ASI Input Port		LP Input Port
7	Data Port (not in use temporary)			
8	NMS Port			
9	External Clock 10MHz Input & Loop out Ports			
10	GPS 1PPS Input & Loop out Ports			
11	RF Output Port			
12	Power Switch			
13	Fuse			
14	AC Power Socket			
15	Grounding			

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Chapter 2 Installation Guide

2.1 Acquisition Check

When user open the package of the device, it is necessary to check items according to packing list. Normally it should include the following items:

- FUTV3501C DVB-T Modulator
- User's Manual
- ASI Cable
- Power Adapter

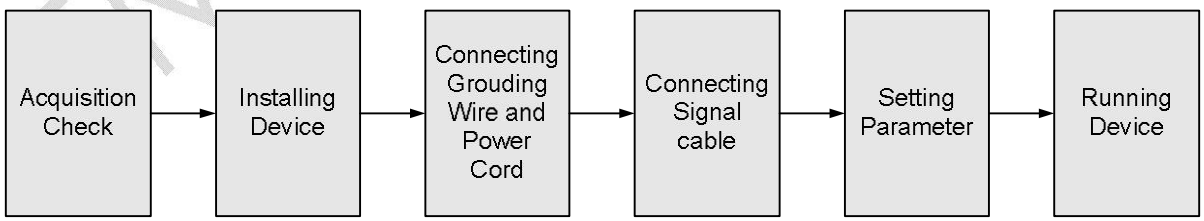
If any item is missing or mismatching with the list above, please contact the local manufacturer.

2.2 Installation Preparation

When user installs the device, please follow the steps below:

- Checking the possible device missing or damage during the transportation
- Preparing the relevant and correct environment for installation
- connecting Internet cable
- Connecting signal cables

2.2.1 Device's Installation Flow Chart Illustrated as following：



2.2.2 Environment Requirement

Item	Requirement
Machine Hall Space	When user installs machine frame array in one machine hall, the distance between 2 rows of machine frames should be 1.2~1.5m and the distance against wall should be no less than 0.8m.
Machine Hall Floor	Electric Isolation, Dust Free Volume resistivity of ground anti-static material: $1X10^{7}$~$1X10^{10}\Omega$，Grounding current limiting resistance: 1MΩ (Floor bearing should be greater than 450Kg/m²)
Environment Temperature	5~40℃(sustainable)，0~45℃(short time)， installing air-conditioning is recommended
Relative Humidity	20%~80% sustainable 10%~90% short time
Pressure	86~105KPa
Door & Window	Installing rubber strip for sealing door-gaps and dual level glasses for window
Wall	It can be covered with wallpaper, or brightness less paint.
Fire Protection	Fire alarm system and extinguisher
Power	Requiring device power, air-conditioning power and lighting power are independent to each other. Device power requires AC 110V±10%, 50/60Hz or AC 220V±10%, 50/60Hz. Please carefully check before running.

2.3 Wire's Connection

- Connecting Power Cord

  User can insert one end into power supply socket, while insert the other end to DC power.

Caution:

Before connecting power cord to FUTV3501C DVB-T Modulator, user should set the power switch to "OFF".

2.4 Signal Cables Connection

The signal connections include the connection of input signal cable and the connection of output signal cable. The details are as follows:

2.4.1 ASI cables illustration:

2.4.2 Network cable illustration:

2.4.3 RF in & loop out cables illustration:

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Chapter 3 Operation

FUTV3501C DVB-T Modulator's front panel is user operation interface, where users start their business. The LCD is a 2-line * 40-character back-lit dot-matrix user interface with pushbuttons for **UP, DOWN, LEFT, RIGHT, ENTER, MENU,** and **LOCK** for front panel control.

User can decide whether to directly use the factory setting, or customize the input/output parameters and business setting manually.

Detailed operations go as follows:

Keyboard Function Description

LEFT/RIGHT: To choose and set the parameters

UP/DOWN：To modify activated parameters or page up/down when parameter is inactivated.

MENU：To cancel presently entered value, resume previous setting;

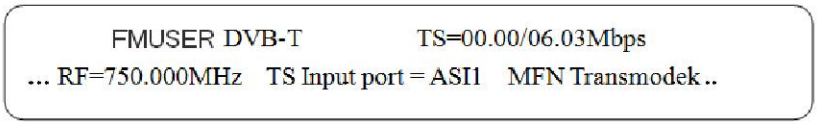
ENTER：To activate the parameters which need modification, and confirm the changes after modification.

LOCK：Lock the screen / cancel the lock state .After pressing lock key, the system will question the users to save or not .If not, the LCD will display the current configuration state

At the "Resume Factory Setting" page, user firstly presses "ENTER" key, consequently system resumes factory parameter setting.

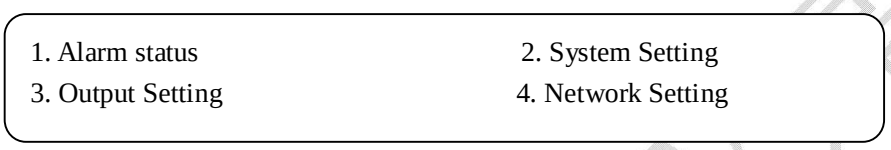
3.1 Initializing

After switching on the Modulator, the LCD sequentially displays in the first line the device name, the valid bit rate of input TS and the overall bit rate the modulator can support. Content scrolling in the second line contains the current RF output frequency, TS input port, MFN Transmission mode, bandwidth, guard interval, constellation, and Alpha mode.



3.2 General Settings

By pressing “LOCK” key to enter the main menu, the LCD will display the following pages:



Press “UP” and “DOWN” or “LEFT” and “RIGHT” key to specify the menu item, and then press “ENTER” to enter the submenu as following pages:

3.2.1 Alarm status

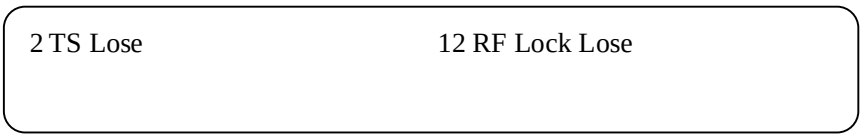
When there are errors occurring, the alarm indicator will turn on and user can enter this menu to check the error count and content.

Error Count:

“2” stands for the number of errors. Whenever an abnormal event happens, the number will increase 1.

Error Description:

After pressing “ENTER”, it will display the error contents as follows.

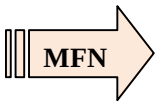


All together there are 13 error types, including 1 TS Overflow, 2 LP TS Overflow, 3 TS Lose, 4 HP TS Lose, 5 LP TS Lose, 6 Internal Reference Clock Lose, 7 External

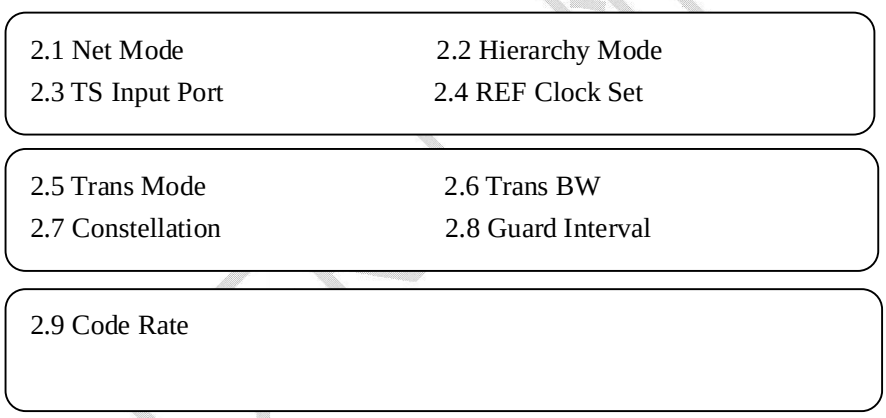
Reference Clock Lose, 8 SFN Error, 9 SFN SIP Lose, 10 Internal Error, 11 1PPS Lose, 12 RF Lock Lose, and 13 Temperature Alarm.

3.2.2 System Setting

Press “MENU” to return to the main menu and then press “UP/DOWN” or “LEFT/RIGHT” to choose this item, and “ENTER” to set the parameters.

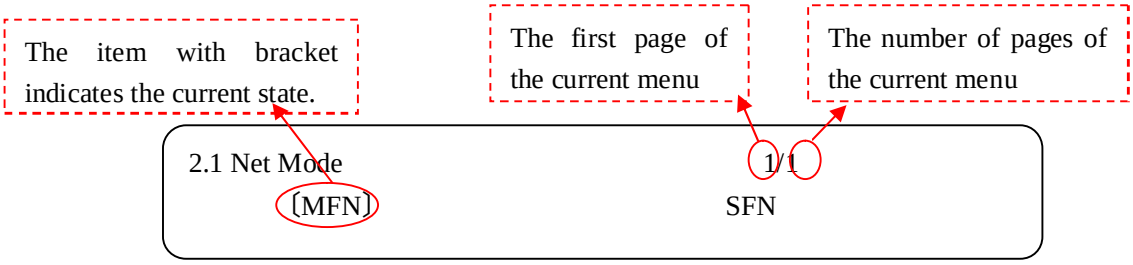
3.2.1.1 MNF Mode 

Under menu “**2 System Setting**”, “**2.1 Net Mode**” contains 2 modes: **MFN** (Multi-Frequency Network) & **SFN** (Single-Frequency Network). When the Net Mode is set as MFN, the system displays as following pages:



l Net Mode

After entering 2.1, the following sub-menu appears to indicate the net mode and user can select the one from the two.


The item with bracket indicates the current state.
The first page of the current menu
The number of pages of the current menu
2.1 Net Mode
〔MFN〕
1/1
SFN

Note: The explanations in red boxes above are applied to this whole manual. User can press RIGHT/LEFT keys to move the bracket and press ENTER key to confirm the modification.

- Hierarchy Mode

When entering 2.2, the LCD displays as follows and user can select hierarchy mode from the 4 options:

```
2.2 Hierarchy Mode                    1/1
[Non]      Alpha 1      Alpha 2      Alpha 4
```

- TS Input Port

- When the hierarchy mode is set as "**Non**" at the previous menu 2.2, user can select the TS input port from the 4 options at this menu 2.3.

```
2.3 TS Input Port                     1/1
[ASI 1]      ASI 2      ASI 3      ASI 4
```

- While the hierarchy mode is set as "**Alpha 1**" (or "**Alpha 2**" or "**Alpha 4**") at the previous menu 2.2, there will be submenus as below:

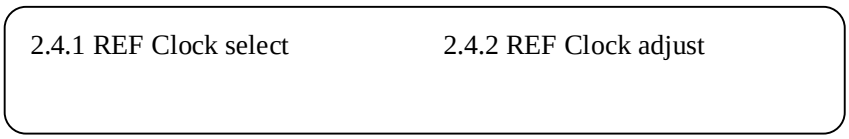
```
2.3.1 HP Input Port          2.3.2 LP Input Port
```

```
2.3.1 HP Input Port                   1/1
              [ASI 1]      ASI 2
```

```
2.3.2 LP Input Port                   1/1
              [ASI 3]      ASI 4
```

Reference Clock Set

When entering 2.4, the LCD displays submenus as follows:



Under menu 2.4.1, user can select the reference clock mode from the 3 modes showing below:

Internal: This modulator uses internal 10MHz crystal oscillator as reference clock.

External: This modulator uses external 10MHz input as reference clock.

Auto: The modulator will preferably select the external 10MHz input if it exists. Otherwise the modulator will select the internal 10MHz crystal oscillator's output as reference clock.

And under menu 2.4.2, reference clock ad can be set manually.

Transmission Mode

When entering 2.5, user can select Transmission Mode from the two options.

Transmission Bandwidth

At this submenu, user can set the bandwidth at 8M, 7M, 6M or 5M.

2.6 Transmission Bandwidth			1/1
[8M]	7M	6M	5M

- Constellation

When entering 2.7, user can select constellation mode from the three options.

2.7 Constellation		1/1
[QPSK]	16QAM	64QAM

- Guard Interval

User can set the guard interval value at this submenu.

The possible guard interval values include 1/32, 1/16, 1/8, 1/4.

2.8 Guard Interval			1/1
[1/32]	1/16	1/8	1/4

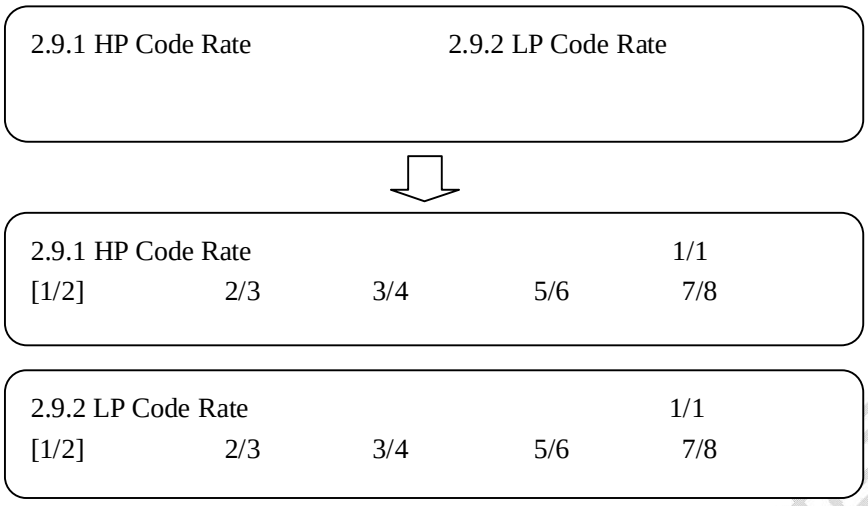
- Code Rate

The submenus under 2.9 Code Rate is different if the **Hierarchy Mode** is set differently.

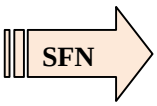
- When the Hierarchy Mode is set as "**Non**", the options for code rate are as follow:

2.9 Code Rate				1/1
[1/2]	2/3	3/4	5/6	7/8

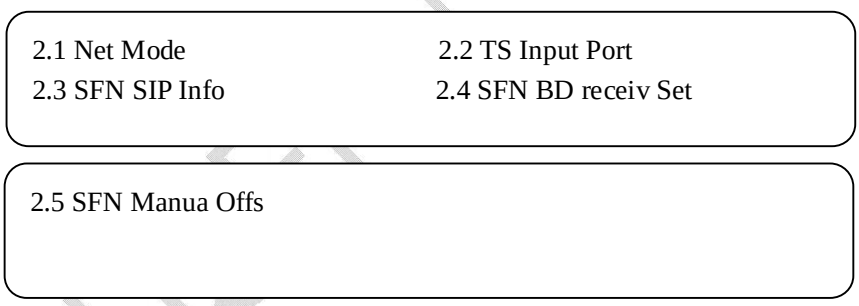
- When the Hierarchy Mode is set as "**Alpha 1**" (or "**Alpha 2**" or "**Alpha 4**"), the submenus and options for code rate are as follow:



3.2.1.2 SNF Mode



Under menu "**2 System Setting**", "**2.1 Net Mode**" contains 2 modes: **MFN** (Multi-Frequency Network) & **SFN** (Single-Frequency Network). When the Net Mode is set as SFN, the system displays as following pages:

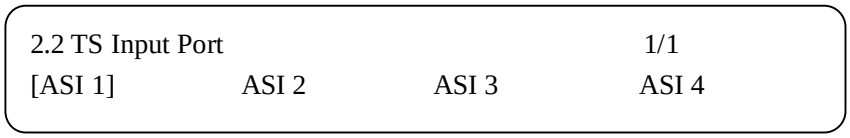


- Net Mode

After entering 2.1, the following sub-menu appears to indicate the net mode and user can select the one from the two.

- TS Input Port

At this menu, user can select the TS input port from the 4 options.

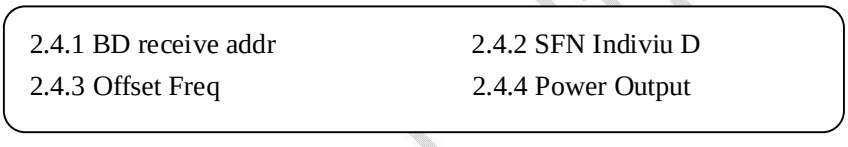


- SFN SIP Information

This is a read-only interface for users to check the SFN SIP information.

- SFN Broadcast Receive Set

When entering 2.4, it displays as follows:



User can enter each item to set or check the corresponding configuration.

2.4.1 Broadcast Receive Address: an editable interface for the broadcast receive address.

2.4.2 SFN Individual Delay: a read-only interface for checking the SFN individual delay.

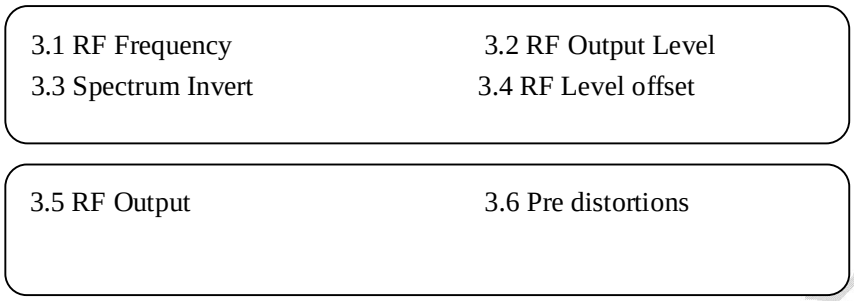
2.4.3 Offset Frequency: a read-only interface for checking the frequency offset.

2.4.4 Power Output: a read-only interface for checking the operability status for power control.

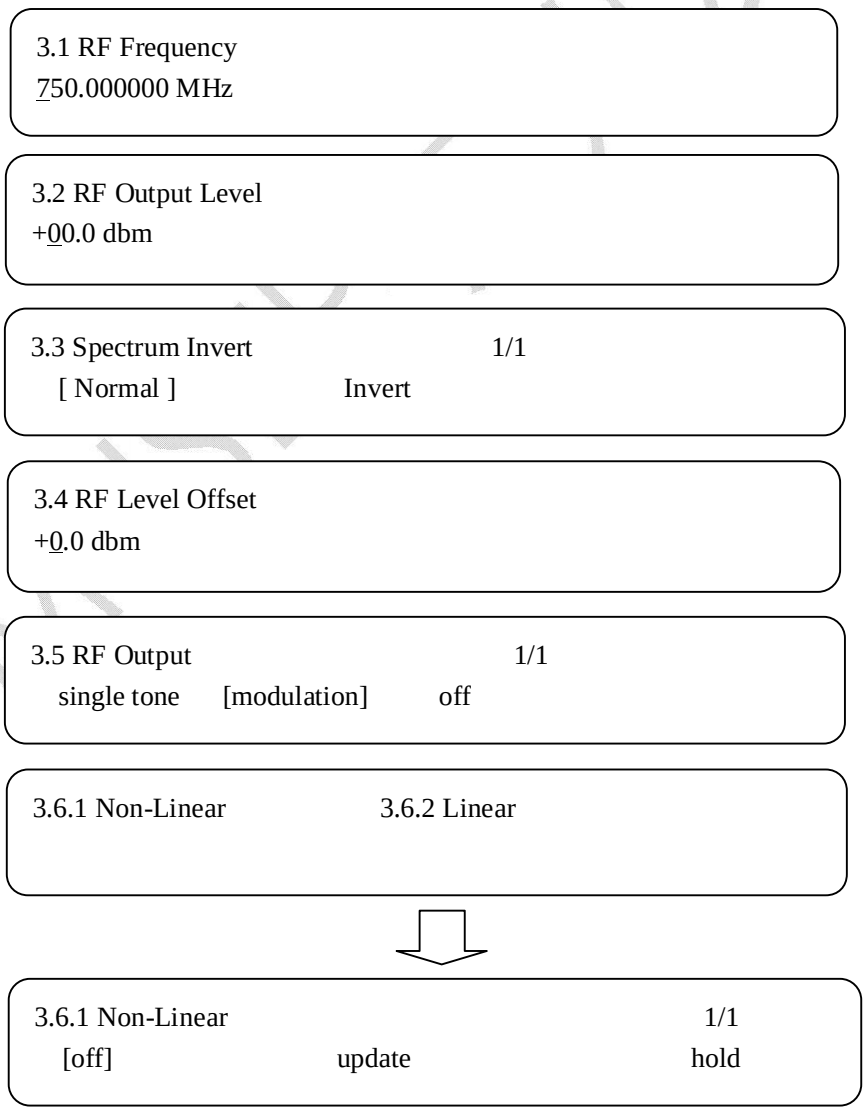
- SFN Manual Offset

When entering 2.5, user can set the SFN manual offset in this interface.

3.2.3 Output Setting



Press “UP/DOWN” or “LEFT/RIGHT” to choose this item and “ENTER” to set the parameters or select the mode of corresponding items. The system displays as following pages:



3.6.2 Linear		1/1
[off]	update	hold

3.2.4 Network Setting

4.1 IP Address	4.2 Subnet Mask
4.3 Gateway	4.4 Console Address

4.5 MAC Address

Under the five items, there are parameters which can be set manually. User can press “UP/DOWN” to choose this item. “ENTER” and “LEFT/RIGHT” to set the parameters. The system displays following pages:

4.1 IP Address
192.168.200.136

4.2 Subnet Mask
255.255.255.000

4.3 Gateway
192.168.000.001

4.4 Console Address
192.168.000.211

4.5 MAC Address
FF-FF-FF-FF-FF-FF

Note: The MAC address is according to the factory setting, and it’s unique.

3.2.5 Saving Configuration

User can choose to save the current configured parameters by pressing ENTER key. The system displays following page:

5.1 Save Current Setting?	1/1
[Yes]	NO

3.2.6 Loading Configuration

At this menu, user can restore the device into the last saved configuration by choosing "6.1" and restore the device into factory configuration by choosing "6.2" and press "LEFT/RIGHT" and "UP/DWON" keys and "ENTER" to confirm.

6.1 Load Saved CFG	6.2 Load Default CFG

6.1 Load Saved Configuration?	
[Yes]	ON

6.2 Load Default Configuration?	
[Yes]	ON

3.2.7 Version

User can check the hardware version and software version of the equipment.

Company Name	Electric
SW 9.12	HW 0.4

Chapter 4 NMS Setting

Network Management System Profile

Network management system is applied to digital TV equipment operation, control and management and parameters setting, etc. It centralizes digital TV equipment through network.

4.1 Installation

The software doesn't need special installation. User can just copy "Network Management Software X.XXY.exe" to the specified directory (X.XX is version number, Y represents language. For example: the version number of network management software 4.01E.exe is 4.01 English version) or place different versions of network management software to the same directory. When the network management software is running, it will generate two documents as follows:

- Network management software X.XXY.log (It preserves the log file.)
- Info. Bin (It's the user configuration data.)

4.2 Software Operation

4.2.1 Login Interface

A login interface will pop up firstly when the software is running and give user prompts to input user name and password (The default user name is **admin** and no password. User can add users and passwords as needed. Details please refer to 4.4.3 in 4.4 Other Settings.). The menu shows as follows:

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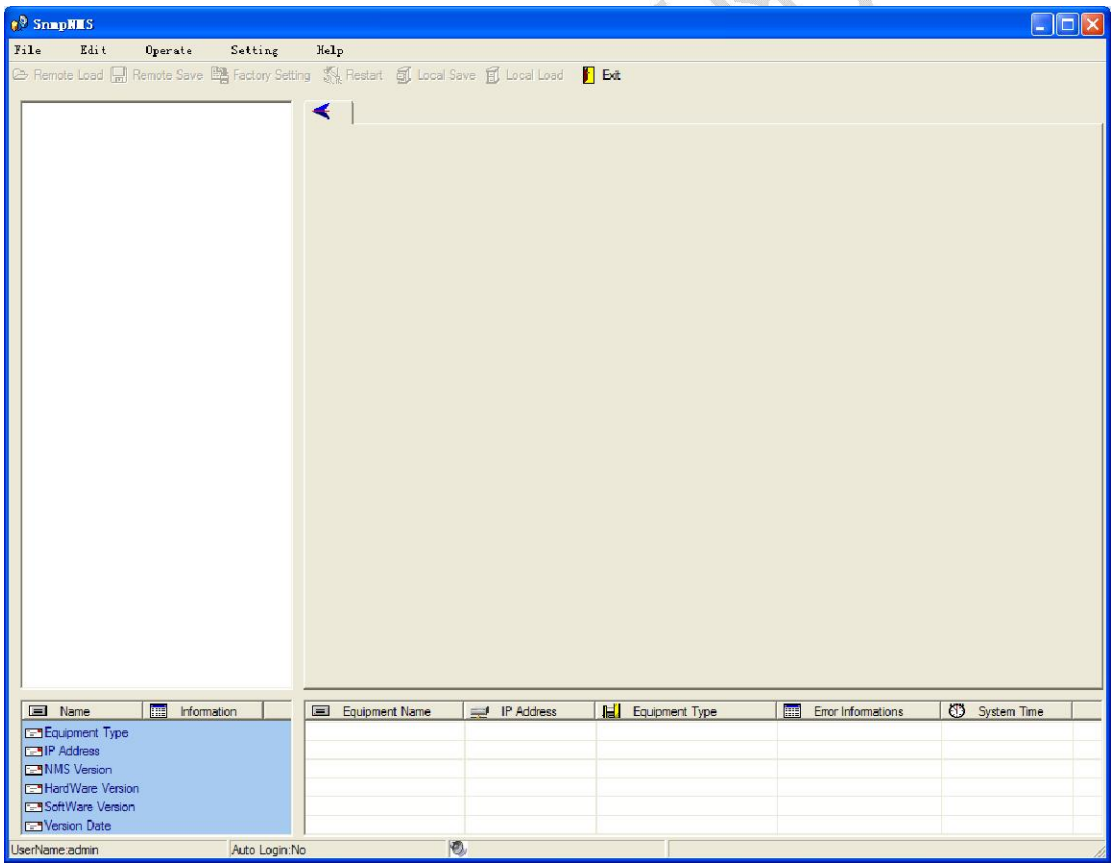
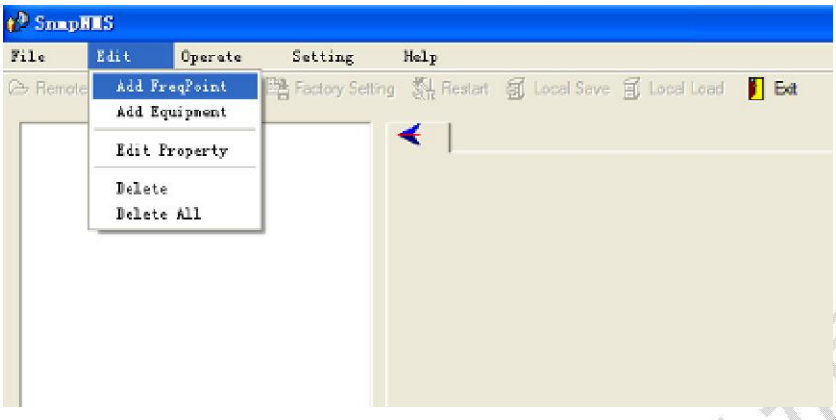
User can login the NMS by pressing **OK** key after inputting user name. Upon the inputs, the software will verify them with database record automatically and the main interface will appear.

4.2.2 Main Interface



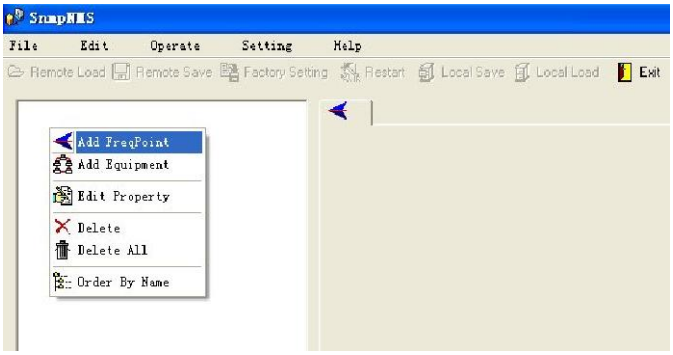
User can create a device node tree in the left column by adding, modifying and deleting the device node. This software provides a powerful node operation function, and the user can edit various parameters in the device tree for management and classification.

4.2.3 Adding Frequency Point



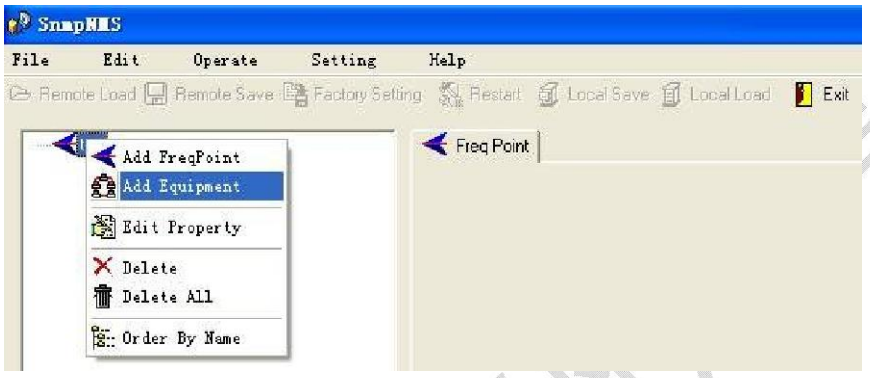
The Add Freq Point dialog box popes up when the user clicks the Add Freq Point item in the Edit pull down menu on the menu row. The device will confirm the given frequency while user clicks **OK**.

User can also click right mouse key to pop up the short-cut menu in device tree or in the left blank column, then the corresponding dialog box will pop up by choosing **Add Main Freq Point.** The device will confirm the given frequency while user clicks **OK.**

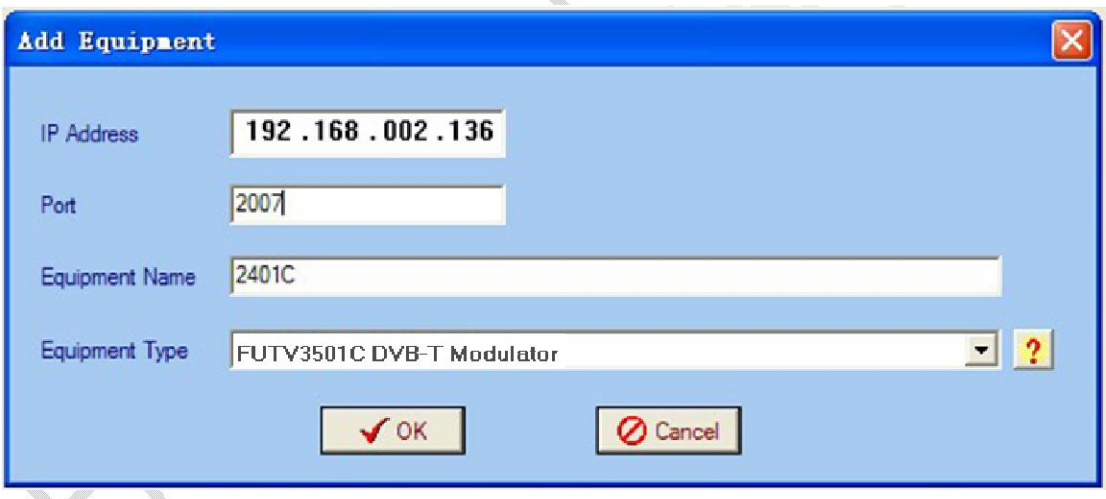


4.2.4 Adding Equipment under Given Frequency Point

User should choose the frequency point in advance, and then the dialog box of Add Equipment will pop up when user clicks “Add Equipment” item in the Edit pull down menu on the menu row.



4.2.5 Edit Equipment Interface



User should follow the steps as below:

- Inputting the device IP Address
- Inputting the port
- Inputting the Equipment Name
- Choosing the connected equipment type in drop down list of “Equipment Type” by clicking the “▼” Or Click “?” to auto search the type of device.

NOTE:

1. The default IP of FUTV3501C DVB-T Modulator is 192.168.2.136, also you can check its IP address in the front panel of device in case the IP changed unexpected.

2. The PC IP address and device IP address should be in the same network. For example the Device IP is 192.168.2.136, sub mask is 255.255.255.0. So the PC IP address should be 192.168.2.X (1<X<255), sub mask is 255.255.255.0. User can use ping command to confirm these two are in same network or not.

4.2.6 Delete Equipment

User can choose the equipment to be deleted in the left column, and then click the "delete" item in the pull down menu which appears by clicking the right mouse key.

4.2.7 Save Configuration

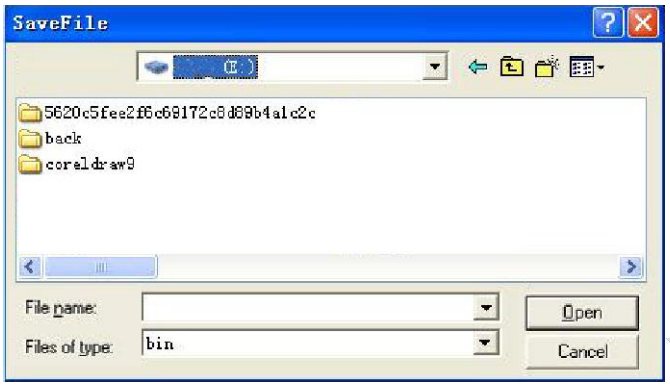
After finishing all the parameters setting, user can click

button on the toolbar to save the modifications to the device's flash, while user can also reload the saved parameters from device's flash and refresh the device's parameters setting according to the loaded values by clicking

Alternatively, user can also click the

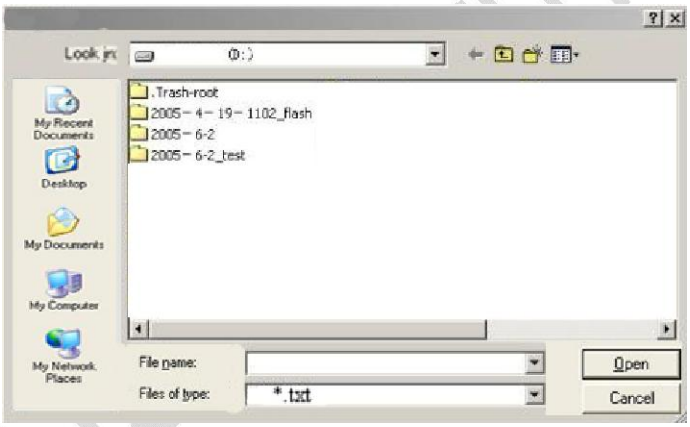
button on the toolbar to popup the

"save file" dialog box, which gives prompts to save all the device's parameters as binary files in the computer's hard disk.



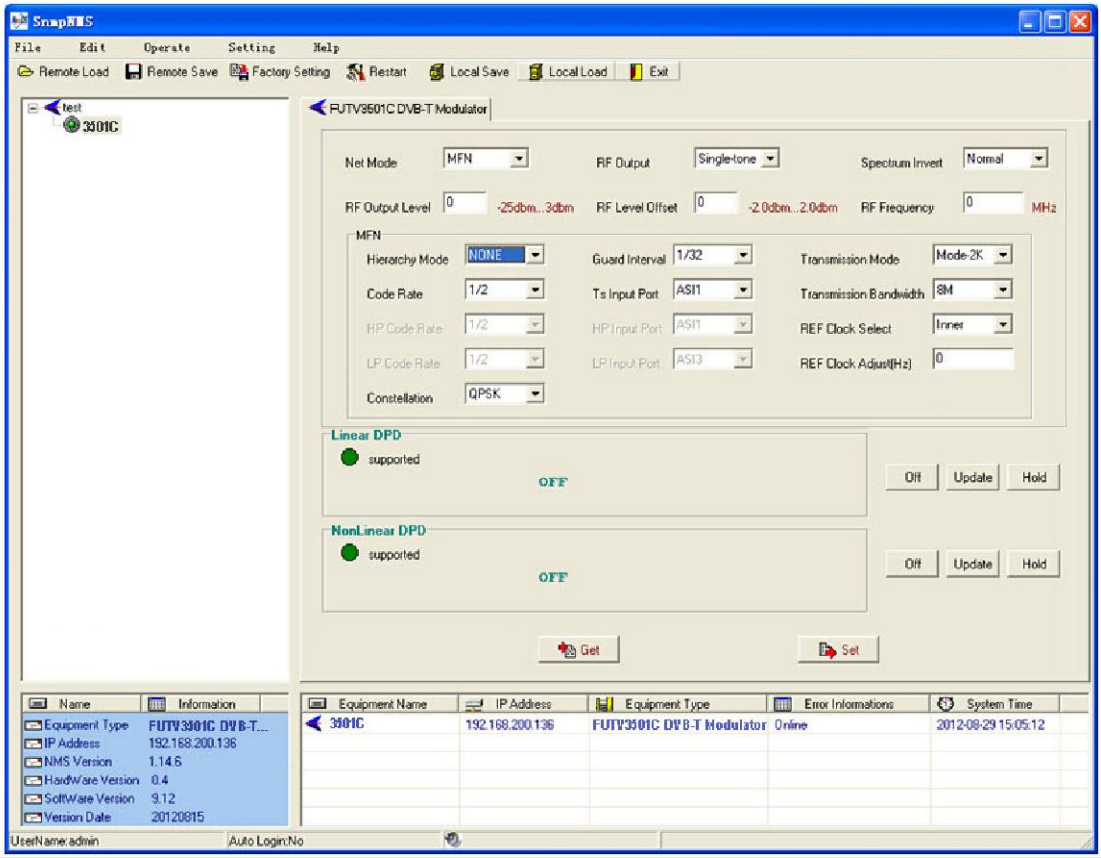
Similarly, user can choose to click the

button on the toolbar to popup the read file dialog box, to read the stored binary file and set the device's parameters according to the loaded binary files.



4.3 FUTV3501C DVB-T Modulator Operation

User can enter the main interface after the operation of "Add Equipment Name". Click on the equipment name to enter the operating interface as below: The indicator turning green indicates the device has been properly connected.



General Explanation:

Set:

to make the current parameters, which show in the NMS software, activate. (In this way, the configuration can only be saved temporarily and will restore the last saved configuration if the device reboots. This is the difference between “Set” and “Remote Save” explained in 4.2.7.)

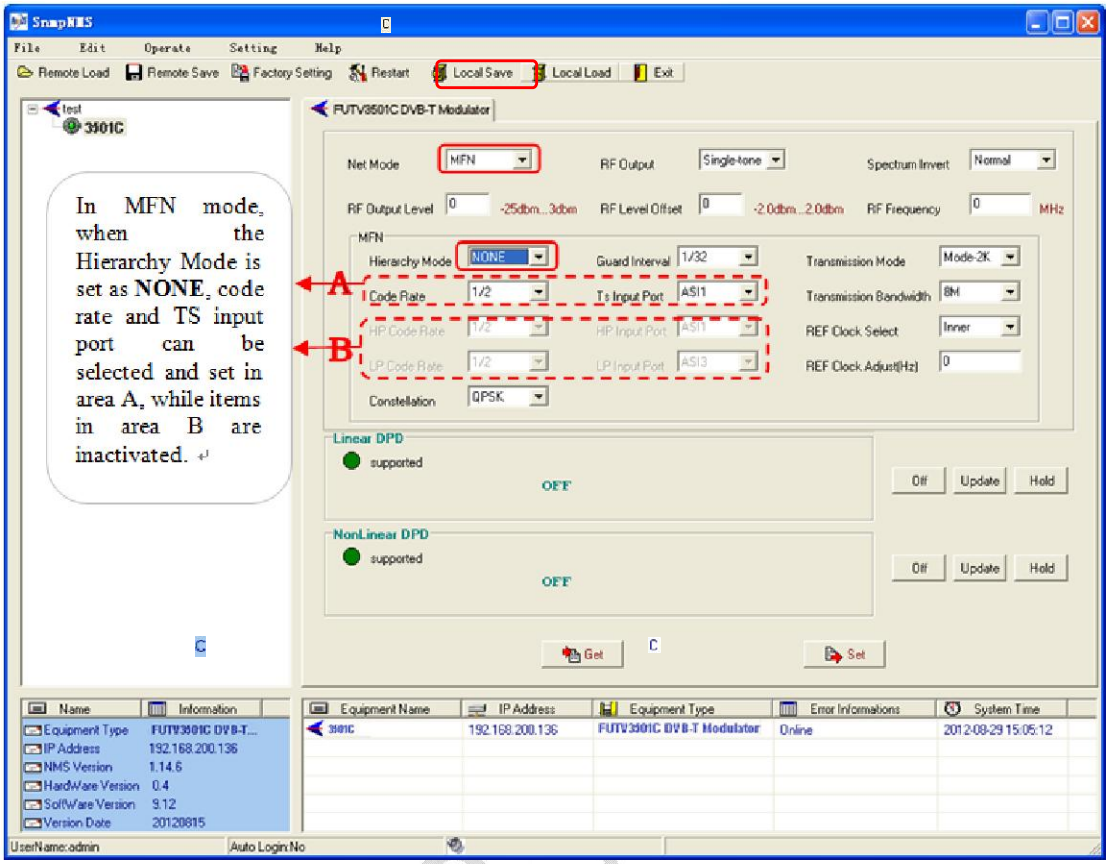
Get:

to read the current device’s activating parameters and show them on NMS software.

The “Net Mode” contains two modes: **MFN** (Multi-Frequency Network) & **SFN** (Single-Frequency Mode).

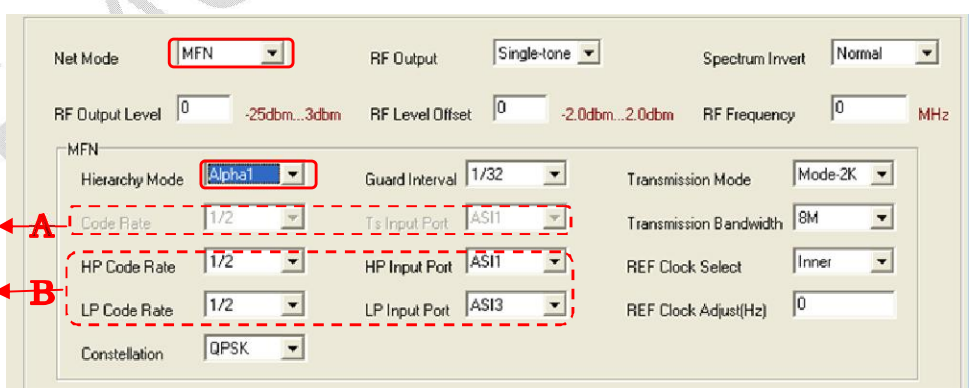
4.3.1 MFN Setting

Ø When the “Net Mode” is set as **MFN** and the “Hierarchy Mode” is set as **NONE**, the system displays as below:



Ø When the "Net Mode" is set as **MFN** and the "Hierarchy Mode" is set as **Alpha 1(or 2, or 4)**, code rate is divided into HP and LP code rate, while TS input port (ASI 1-4) is divided into HP input port (ASI 1-2) and LP input port (ASI 3-4). the system displays as below:

In MFN mode, when the Hierarchy Mode is set as **Alpha 1/2/4**, code rate and TS input port in area A are inactivated, while items in area B can be selected and set.

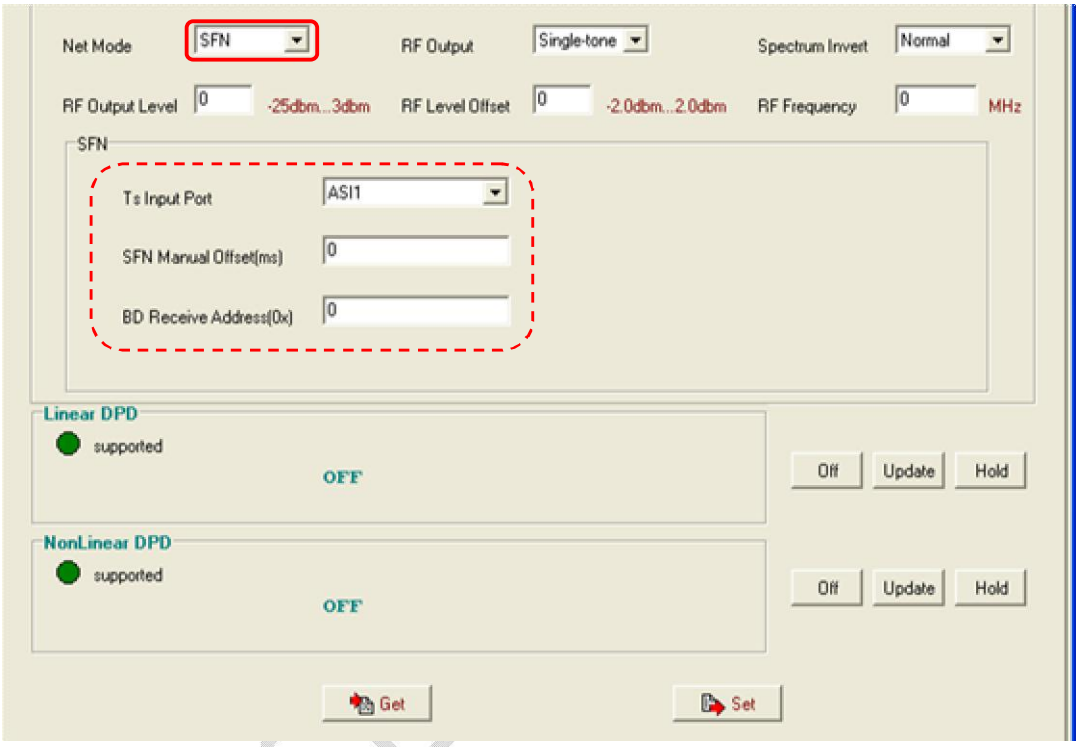


Net Mode/RF Output/ Spec Invert/ RF Output Lever/ RF Level Offset/ RF Frequency/Guard Interval/Transmission Mode/Transmission Bandwidth/REF Clock Select/REF Clock Adjust/Constellation:

User can click to trigger a pull-down list or directly input the value in the box to configure the settings.

4.3.2 SFN Setting

When the "Net Mode" is set as **SFN**, the system displays as below:



User can click to trigger a pull-down list or directly input the value in the box ot to configure the settings.

4.3.3 DPD Operation:

DPD (digital pre-distortion) is divided in to two parts: non-linear and linear. User can respectively set the value by clicking Update, Off and Hold. When clicking Update, it will display the progress bar as shown below:

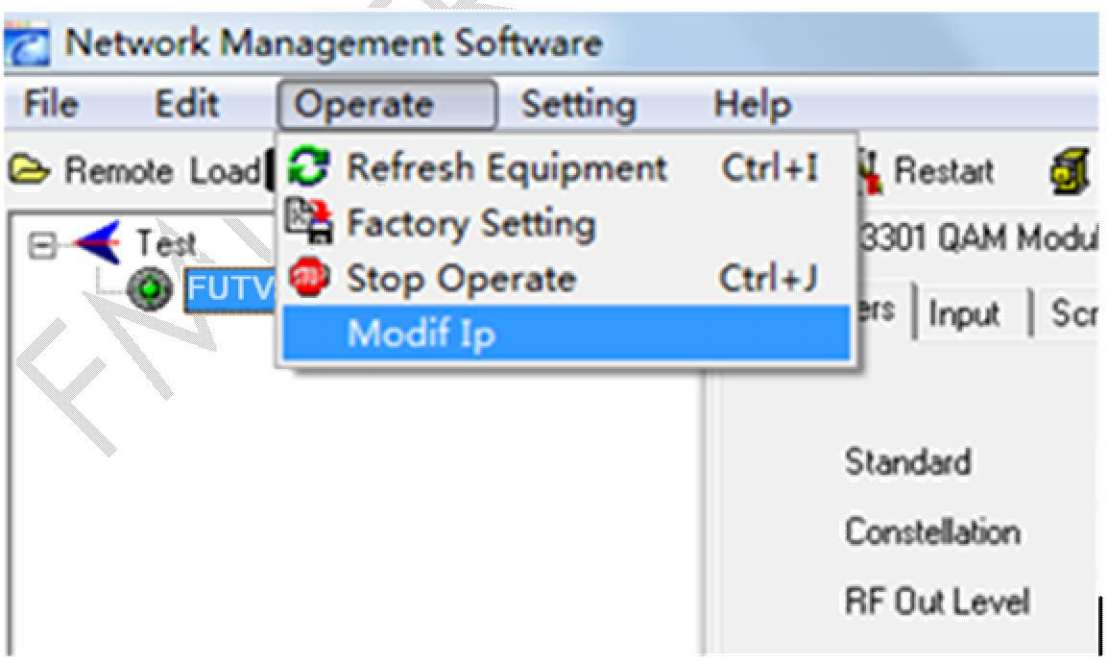
4.4 Other Settings

4.4.1 Difference between Set and Remote Save

In many cases during the configuration of parameters in NMS, users save the modified configuration by clicking “Set”, in which way the configuration can only be saved temporarily and will restore the last saved configuration if the device reboots. To save the configuration permanently, it is required to operate through “Remote Save” on the toolbar explained in 4.2.7.

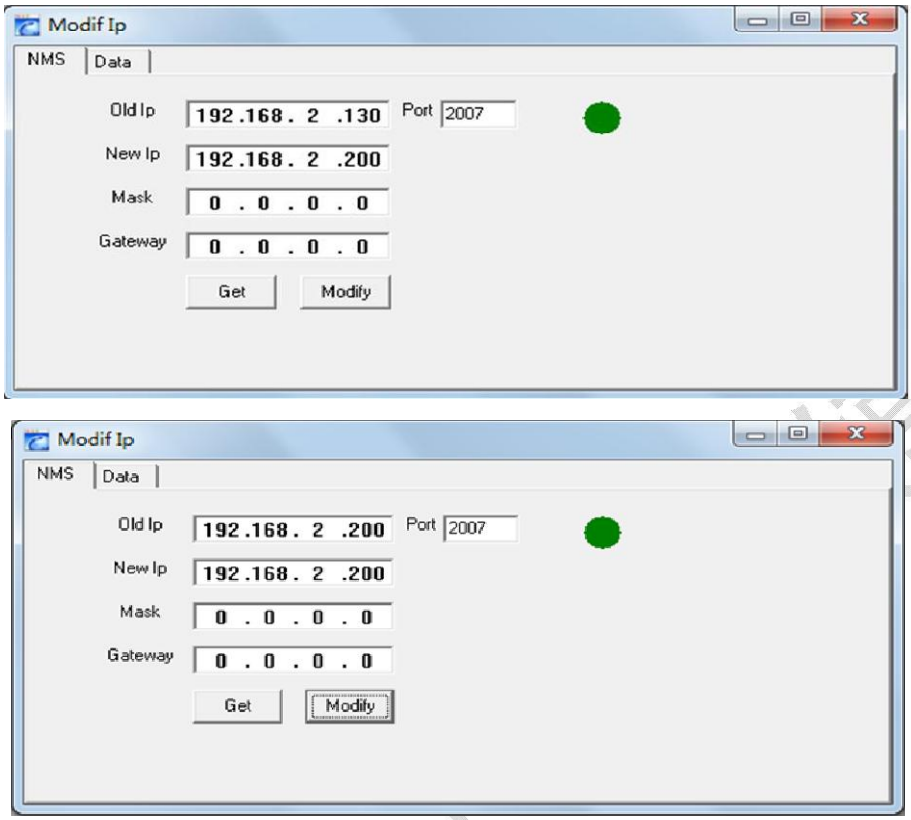
This is the difference between “Set” and “Remote Save”.

4.4.2 IP Modification

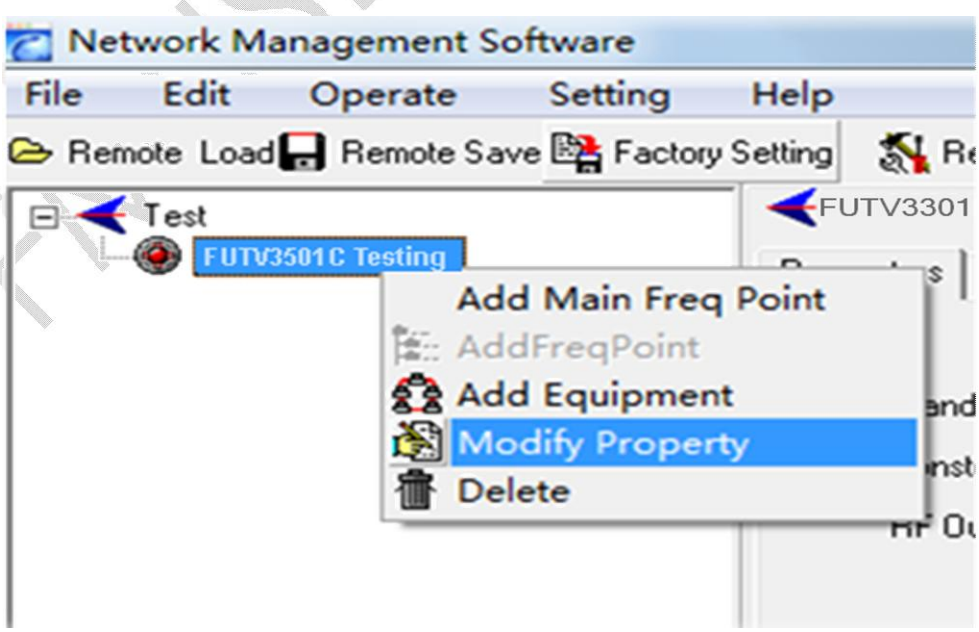


Users can click **Operate** and select **Modify IP** in the drop down list, and a dialog box presents itself as shown below. Users input the new NMS IP Address for the device

and click Modify button to confirm.



Users can note the indicator light turns red (see below), which signifies the equipment has disconnected. Users then can refer to below prompts to edit the property by inputting the new IP to re-connect the equipment.

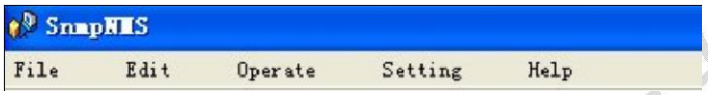


After finishing all the parameters setting, user should click

button on the toolbar to save the modifications to the device's flash.

4.4.3 User Add

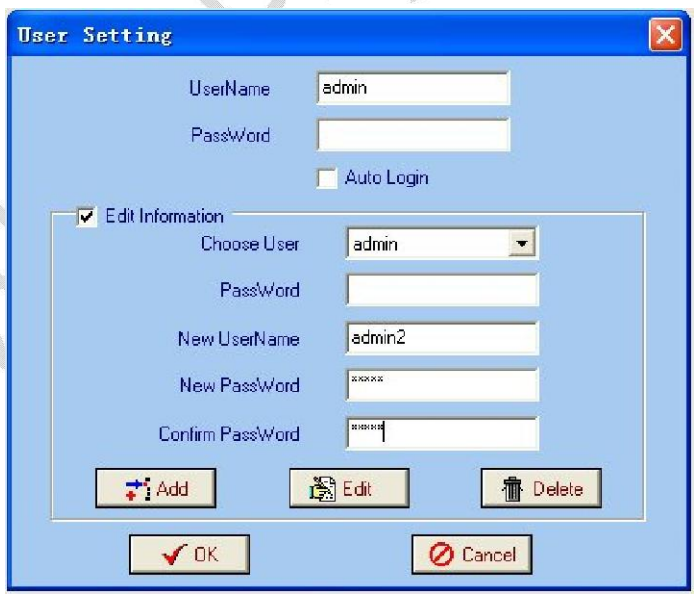
When logging in, user will note that the default user name is **admin** and no password. User can add users and passwords as needed.



User clicking "Setting" in the menu bar and selecting "User Setting" in the pull-down list, the below dialog box will pop out as shown below. Select the "Edit Information" by marking the check box with "√", user can input the new username and new password as prompts below. It is required to click

to add the new user and then click

to save the new setting.



Chapter 5 Troubleshooting

FMUSER's ISO9001 quality assurance system has been approved by CQC organization. For guarantee the products' quality, reliability and stability. All FMUSER products have been passed the testing and inspection before ship out factory. The testing and inspection scheme already covers all the Optical, Electronic and Mechanical criteria which have been published by FMUSER. To prevent potential hazard, please strictly follow the operation conditions.

Prevention Measure

- Installing the device at the place in which environment temperature between 0 to 45 ℃
- Making sure good ventilation for the heat-sink on the rear panel and other heat-sink bores if necessary
- Checking the input AC within the power supply working range and the connection is correct before switching on device
- Checking the RF output level varies within tolerant range if it is necessary
- Checking all signal cables have been properly connected
- Frequently switching on/off device is prohibited; the interval between every switching on/off must greater than 10 seconds.

Conditions need to unplug power cord

- Power cord or socket damaged.
- Any liquid flowed into device.
- Any stuff causes circuit short
- Device in damp environment
- Device was suffered from physical damage
- Longtime idle.
- After switching on and restoring to factory setting, device still cannot work properly.
- Maintenance needed

Chapter 6 Packing List

- FUTV3501C DVB-T Modulator 1pcs
- User’s manual 1pcs
- ASI cables 2pcs
- SMPTE cables 2pcs
- Power adapter 1pcs

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